WNV Response Plan Attachments

Glossary of Terms and Abbreviations

Surveillance

- **Wild Bird Surveillance for WNV in NC** – Guide for identifying appropriate wild birds for arboviral testing and instruction on proper handling.

- **Surveillance for WNV in Avian Species** – Guide for identifying appropriate wild birds for arboviral testing and instruction on proper handling.

- **Instructions for Collection and Shipment of Animal Carcasses** – Counties MUST first contact the NC PHPM Office BEFORE submitting dead birds to USGS.

- **Dead Bird Reporting and Submission Form** – Form to be completed when submitting dead bird for arboviral testing. Counties MUST first contact the NC PHPM Office BEFORE submitting dead birds to USGS.

- **Entomological Surveys for WNV Surveillance in NC** – Explains the importance of identifying local mosquito activity patterns to successful mosquito management.

- **Human Surveillance Component** – Plan for tracking potential human cases of WNV.

- **West Nile Virus Encephalitis** – Background information about WNV epidemiology; description of human symptoms of WNV infection; and instructions for sending human sera samples for testing. This document was designed for healthcare practitioners.

- **WNV Laboratory Surveillance Activities** – Information about the analytical component of WNV surveillance.

Control and Intervention

- **Insect Repellent and Pesticide Information** – Practical information about various insect repellents and their effectiveness; EPA's information about pesticides and their use, including potential harmful effects on human health and the environment.

- **Malathion Information –** Information about the most commonly used pesticide in North Carolina.

Communications

- **DHHS/DENR West Nile Virus Public Information Plan –** Plan for increasing public awareness about WNV and other mosquito-borne viruses and educating the public about what it can do to reduce its risk from these viruses.

- **Press Releases –** Release issued by DENR in May announcing start of mosquito season and instructing residents on becoming "Skeeter Defeaters" by eliminating mosquito breeding grounds, reducing exposure to mosquito bites, and reporting dead or dying birds; release issued by NCDA&CS in May alerting horse owners about mosquito-borne viruses.

- **WNV Brochures and Flyers –** Communication tools designed to educate the public about WNV and other mosquito-borne viruses and what individuals can do to reduce the risk of exposure to these viruses.

Resources

- **Mosquito Control Agencies in NC** – List of all mosquito control agencies in the state, including contact information. See web-site at:

http://ipmwww.ncsu.edu:8150/NCMVCA/county%20programs/counties.htm

- **Information on the Web** – List of web sites with information about WNV.

Glossary of Terms and Abbreviations

Animal Disease Diagnostic Laboratory System	The North Carolina Animal Disease Diagnostic Laboratory System was established in 1950 by the North Carolina Department of Agriculture and Consumer Services to assist owners and their veterinarians in diagnosing diseases of livestock and poultry, and in preventing outbreaks of catastrophic foreign animal disease by early detection. The lab system is located in the Veterinary Division.
Arboviral	Refers to any of various RNA viruses (as the causative agents of encephalitis, yellow fever, and dengue) transmitted chiefly by arthropods.
CC&PS	NC Department of Crime Control and Public Safety. The Division of Emergency Management (NCEM) is located in this department.
CDC	U.S. Centers for Disease Control and Prevention.
CNS	Central Nervous System.
Council of State	The Council of State is made of the highest elected officials in North Carolina state government. The Council is chaired by the Governor, and includes the Lieutenant Governor, Attorney General, Commissioners of Agriculture, Insurance, and Labor; Superintendent of Public Instruction Secretary of State, State Treasurer, and State Auditor.
DEH	Division of Environmental Health (DEH) is part of the NC Department of Environment and Natural Resources. The five sections of this division include Environmental Health Services, Public Water Supply, On-site Wastewater, Public Health Pest Management, and Shellfish Sanitation.
DENR	NC Department of Environment and Natural Resources. The Division of Environmental Health, Public Health Pest Management (PHPM) Section, is located in this department.
DHHS	NC Department of Health and Human Services. The Division of Public Health (DPH), Epidemiology Section is located in this department, and is the lead agency for purposes of this public health response plan to the West Nile virus.

Glossary of Terms and Abbreviations

EEE	Eastern Equine Encephalitis. A viral infection that is transmitted primarily through an infected mosquito bite.
Entomology	Branch of zoology that deals with the study of insects.
Epidemiology	A branch of medical science that deals with the incidence, distribution, and control of disease in a population.
Epizootic	Refers to an outbreak of disease affecting many animals of one kind at the same time. It can also refer the disease itself.
General Communicable Disease Control Branch	The State Epidemiologist is located in the General Communicable Disease Control Branch, which is part of the NC Department of Health and Human Services, Division of Public Health, Epidemiology Section. This branch is responsible investigating disease outbreaks; implementing control measures to minimize further transmission of disease; monitoring disease-reporting by physicians and laboratories in order to detect trends; assessing the public health impact of diseases; providing a channel of communication between public health agencies, private physicians, and hospital and occupational infection control personnel; explaining public health interventions, and disseminating health education messages to the community and the media.
LHD	Local Health Department.
NCDA&CS	NC Department of Agriculture and Consumer Services.

Glossary of Terms and Abbreviations

NCEM	The Emergency Management Division is one of nine agencies within the North Carolina Department of Crime Control and Public Safety. The division, created by the Emergency Management Act of 1977, is responsible for protecting the people of North Carolina from the effects of disasters, natural and manmade. It was reorganized in 1997 into functional units, using the "Incident Command system (ICS)," the national model for managing emergency operations. This organizational structure mirrors the local incident command structure and the federal Emergency Response Team structure, thus streamlining and simplifying intergovernmental coordination. The six major functional sections are Public Information, Hazard Mitigation, Operations, Logistics, Information and Planning, and Finance.
NCSLPH	The North Carolina State Laboratory of Public Health (NCSLPH) provides certain medical and environmental laboratory services (testing, consultation and training) to public and private health provider organizations responsible for the promotion, protection and assurance of the health of North Carolina citizens. The NCSLPH is part of the NC Department of Health and Human Services, Division of Public Health.
PHPM	Public Health Pest Management Section. Located in the Division of Environmental Health, this section is charged with the responsibility of providing technical and financial assistance to local health departments and local governmental units to control vectors of public health significance.
Sentinel Flock	Sentinel Flocks are an important part of the surveillance and monitoring program in North Carolina. Each flock consists of five hens, housed in specially designed cages that provide protection from the elements without restricting exposure to mosquitoes. Food and water are provided by local caretakers.
SERT	The State Emergency Response Team (SERT), which is comprised of top level management representatives of each state agency involved in response activities, provides the technical expertise and coordinates the delivery of the emergency resources used to support local emergency operations. This team is coordinated through the Division of Emergency Management.

Glossary of Terms and Abbreviations

Surveillance	The ongoing, systematic collection, analysis and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of these data to prevention and control.
ULV Adulticiding	The application of pesticide, by air or by land, using an ultra-low volume (ULV) applicator. This distributes the pesticide, in low volume, over a large area. Adulticiding means using a pesticide that is specific for killing the adult life stage of the mosquito or insect life cycle.
USGS	United States Geological Survey. The USGS is a science agency that is part of the US Department of the Interior.
Veterinary Division	Within the NC Department of Agriculture and Consumer Services, the Veterinary Division focuses on providing animal disease programs designed to control and eliminate animal diseases and ensure general animal health. The State Veterinarian is head of this Division.
Veterinary Public Health	Veterinary Public Health provides services to physicians, health departments, hospital ERs, veterinarians and the public concerning diseases transmitted between people and animals (zoonoses). Veterinarians assist in determining if such a disease is present, and advising what to do to prevent such a recurrence in the future. This program is located within the NC Department of Health and Human Services, Division of Public Health, Epidemiology Section, Occupational and Environmental Epidemiology Branch.
WNV	West Nile virus. WNV infection in humans most often produces mild, flu-like symptoms, or no symptoms at all. Only a small number of people become very ill, and fewer still die from the disease, according to information from the Centers for Disease Control and Prevention (CDC).

Glossary of Terms and Abbreviations

WNV Core Team	A task force of experts from state and local government agencies, and universities. The Core Team is responsible for recommending public, environmental, and veterinary health measures necessary to identify, evaluate, and control the spread of WNV in North Carolina. The task force reports to the State Health Director or designee.
WRC	The North Carolina Wildlife Resources Commission (WRC) consists of wildlife and fisheries biologists, wildlife enforcement officers, educators, engineers and administrative staff in nine districts across the state.
Zoonosis	A disease communicable from animals to humans under natural conditions (e.g., rabies, West Nile virus).

Wild bird surveillance for WNV in NC

Surveillance of wild birds has proven to be effective in the early detection of WNV in the northeastern states. The assumption that wild bird surveillance also will be effective in NC has driven this state's early surveillance efforts. While an ideal wild bird surveillance system would include the documentation, retrieval and testing of all dead or clinically ill wild birds, limited in-state lab capacity dictates a more restrictive approach. North Carolina must depend on the National Wildlife Health Center (NWHC), US Geological Survey, in Madison, WI, to test the birds collected. The NWHC has agreed to process only 100 birds from NC this season. NC may have the option of having more birds tested by NWHC if funds become available. Other laboratories may also be available to test birds from NC later.

Because of these restrictions on the number of birds that can be tested, only those birds with a high probability of infection can be submitted. No birds will be processed by NWHC without authorization from the Public Health Pest Management Section, NCDENR. Birds should not be shipped until the PHPM Section can evaluate the need for testing. If dead birds are found in significant numbers in a small area, such as a yard or field, then pesticide poisoning is a probable cause of mortality, and only one or two birds from the area should be shipped for testing. Several dead birds found in a neighborhood are more indicative of a disease problem, such as WNV.

Corvids (crows and jays), and raptors (hawks, owls, eagles, and other birds of prey) found dead, any other LIVE wild bird seen displaying behavior consistent with neurological disease (difficulty walking, flying, standing, swimming, or incoordination) should be tested. If resources permit, other wild bird species, such as sparrows, which have been shown to have high infection rates with WNV in the northeastern states may also be collected and tested. Collection and shipping of birds for WNV testing should be done according to the published procedures of the NWHC, available on the PHPM website:

http://www.deh.enr.state.nc.us/phpm/pages/index.html

Since funding is limited for wild bird surveillance, the State must depend on county personnel to screen reports, collect the target species and ship them for testing. The key on the next page may be used for screening birds. After birds have been secured, call 919-733-6407 to get an authorization number for shipping.

A COPY OF THE COMPLETED SUBMISSION FORM MUST BE SENT TO:

Dr. Barry Engber
PHPM Section, NCDENR
1631 Mail Service Center
Raleigh, NC 27699-1631
fax...919-733-7618
phone...919-733-6407

One should thoroughly wash his/her hands after collecting birds for testing.

Questions on specific issues relating to bird collection, shipping, testing and the interpretation of results should be addressed to the PHPM Section. NWHC sends all results of NC tests to Dr. Barry Engber of the PHPM Section. PHPM will report all findings through the Local Health Director's list server and the Environmental Health list server, as well as through the dedicated West Nile Virus list server.

Below is a simple key to determine if a reported bird should be tested for WNV. It may need to be modified for specific counties. All reports should be entered into a local database or spreadsheet and followed to determine if excessive wild bird mortality is occurring. Wild bird mortality occurs for many reasons. Larger crow populations in eastern NC may make crow mortality more useful for predicting WNV activity there than in central and western NC.

Questions to ask a caller reporting a dead bird:

1. Is the bird alive?
   If yes, go to.....2
   If no, go to.....4.

2. Is the bird having difficulty with coordination, walking, flying, or swimming, or is it acting oddly?

   If yes, go to.....3
   If no, advise the caller that the bird cannot be collected for processing.

3. Do you think you can catch the bird?

   If yes, advise the caller to catch the bird and hold it safely for pick up by the department. Get the name, address and phone number of the caller and notify your designated bird retriever.
   If no, ask the caller to keep an eye on the bird until your designated bird retriever can get to the site and try to catch the bird. Get the information requested above.

4. Does the bird stink, have maggots on/in it, appear to be rotten, look like it's been chewed or otherwise physically damaged, or is it likely to have been dead for more than 36 hours?

   If yes, record the information and thank the caller, then tell him/her that the bird cannot be tested and should be buried or otherwise disposed of.
   If no, then go to.....5

5. Ask the caller if he/she can tell you what kind of bird it is.
   If yes, go to.....6
   If no, go to.....7

Continued on next page……

6. Is it a crow, jay, hawk, eagle, owl, shrike, falcon, or other bird of prey?

If yes, then advise the caller to collect the bird according to the NWHC guidelines and hold it for pick up. Get the information detailed above in 3.
If no, record the information and thank the caller, then tell him/her that the bird cannot be tested and should be buried or otherwise disposed of.

7. Ask the caller to describe the bird. Using any references available, try to determine if it is a corvid or raptor. It may be necessary to have one of the county staff go by and look at the bird to make a determination if it's one of the target species.

If yes, advise the caller to collect the bird for pick up as described above.
If no, advise the caller to dispose of the bird.

NHN
5 July 2001

May 2001

SURVEILLANCE FOR WEST NILE VIRUS IN AVIAN SPECIES

A sensitive indicator of West Nile Virus (WNV) activity in a general geographic area is the presence of dead birds that are positive for WNV. A variety of approaches for dead bird surveillance have been used by states where previous WNV outbreaks have occurred. These activities have ranged from reporting and testing only dead crows in some states, to testing all bird species in other states. Approximately 88% of the dead birds that tested positive for WNV in 2000 were American and fish crows (in the *Corvidae* family). However, in a few New York counties, species other than crows were the first birds found positive for WNV and in some counties in New York and Vermont, crows were not among the birds positive for WNV. The blue jay is another member of the *Corvidae* family that appears to be quite susceptible to WNV; blue jays are the only other *Corvidae* species common in areas where WNV has occurred to date. A greater variety of *Corvidae* species are found in the western states and testing of all birds in the *Corvidae* family (includes jays, magpies and crows) for WNV should be considered. Raptor species also appear to be very susceptible to WNV and are considered good indicator species.

During the 1999 and 2000 WNV outbreaks, birds determined to be positive for WNV were most commonly found dead. The small percentage of sick birds observed exhibited the following clinical signs: weakness; lethargy; tremors; inability to walk, fly, perch, or hold their wings normally against their body; and lack of fear of humans (easily approached). These signs of generalized illness are NOT unique to WNV infection. Birds positive for WNV were often in fair to poor physical condition with loss of fat and muscle mass particularly noticeable in the breast muscles.

Our Center requests submission of either **freshly dead** (less than 48 hours old) intact (not scavenged) birds or tissues collected from freshly dead birds. If the carcass has an odor, is soft and mushy, has skin discoloration, feathers or skin that easily rubs off, or has maggots present, it is too decomposed for testing. Based on data from the past two years, selection of *Corvidae* species or raptors will increase the probability of detecting WNV in your state. We prefer you submit kidney, liver, and spleen with each tissue placed in a separate, sterile, leak-proof bag. Store tissues at ultra-low temperatures and ship them frozen on dry ice for testing. We prefer overnight delivery of carcasses that are shipped chilled on blue ice packs or tissues that are shipped on dry ice. This year we will extract tissues from bird carcasses for virus isolation, RT-PCR, and IFA testing. Selected tissues will be put into cell culture. Virus isolation attempts can take approximately two weeks to complete. We will issue weekly reports as the samples are being processed and a final report when all samples are completed.

DO NOT SHIP ANY BIRDS FROM NC WITHOUT FIRST CALLING 919-733-6407.

INSTRUCTIONS FOR COLLECTION AND SHIPMENT OF ANIMAL CARCASSES TO THE USGS NATIONAL WILDLIFE HEALTH CENTER FOR WEST NILE VIRUS EVALUATION

Please follow these instructions for collecting and shipping carcasses for West Nile virus testing to the National Wildlife Health Center (NWHC) to insure adequate and well preserved specimens.

1. Collect sick or freshly dead birds. Carcasses that are decomposed or scavenged are usually of limited diagnostic value. If the carcass has an odor, is soft and mushy, has skin discoloration, feathers or skin that easily rubs off, or has maggots present, it is too decomposed for testing. Ideally, collect a combination of freshly dead animals and animals that were euthanized after their behavior is observed and recorded.

2. Use rubber gloves when picking up sick or dead animals. If you do not have gloves insert your hand into a plastic bag. Take a cooler containing ice into the field to immediately chill the carcass(s).

3. Place each animal in a plastic bag, tie shut, then place inside a second bag and tie shut (more than one individually bagged animal can be placed in the second bag). Double bagging carcasses prevents cross-contamination of individual specimens and leaking from shipping containers.

4. Complete a separate copy of the attached Dead Bird Reporting and Submission Form for each bird. Place copies of the forms in an envelope and tape to the outside of the shipping container. If more than one bird is submitted, please include identification on each bird to match the forms.

5. Ship birds in a hard sided plastic cooler or a Styrofoam cooler placed in a cardboard box. Unprotected Styrofoam coolers break into pieces during shipment. Stuff crumpled newspaper into any spaces between the sides of the box and cooler. Hard-sided (plastic) coolers will be returned if you label with your name and address in permanent ink.

Line the cooler with a plastic bag and pack the individually bagged carcasses in the cooler with enough blue ice to keep carcasses cold. Blue ice is preferred to wet ice to avoid leaking during shipment. Use dry ice for tissue samples. Place crumpled newspaper or similar absorbent material in the cooler to fill unused space, keep ice in contact with carcasses, provide insulation, and absorb any liquids. Tape cooler or box shut with strapping tape.

Label coolers with: **USGS National Wildlife Health Center**
6006 Schroeder Road
Madison, WI 53711

Include on the top of the cooler **DIAGNOSTIC SPECIMENS - WILDLIFE**

6. Contact Kimberli Miller by phone (608-270-2448), e-mail (kim_miller@usgs.gov) or FAX (608-270-2415) prior to shipping animals. Ship Monday through Thursday morning by overnight service. Do not ship on Friday unless you have called to make special arrangements because the Center is closed on Saturday. If you cannot call or ship within 24-36 hours, freeze the bird(s).

National Wildlife Health Center

May 15, 2001

West Nile Virus Reporting and Submission Form For Individual Birds

NC SUBMITTERS: DO NOT SHIP ANY BIRDS FOR TESTING UNTIL YOU HAVE CALLED 919-733-6407 AND RECEIVED A TESTING CODE

Submit freshly dead birds (< 48 hours) for WNV testing only if there is no obvious cause of death

State ID number _____ NWHC ID number_____

Person completing form:

Name: _____ Phone: _____

Agency: _____ FAX: _____

Street: _____ E-mail: _____

_____

City: _____ State: _____ Zip: _____

Bird Species: _____

Bird found [Dead] or [Sick and Euthanized] circle one

Date collected: ____/_____/_____ Date shipped: ____/____/____

Exact Location bird found: _____

State: _____ County: _____ Town/City: _____

Zip Code: _____

IMPORTANT: Place a leg tag on the bird with the NWHC number and state reference numbers on the top of this form. Read the shipping instructions.

Ship to:
NATIONAL WILDLIFE HEALTH CENTER
6006 SCHROEDER ROAD
MADISON WI 53711

DIAGNOSTIC SPECIMENS - WILDLIFE

Send copy of form AND final report to:
DR BARRY ENGBER
PUBLIC HEALTH PEST MANAGEMENT
1631 MAIL SERVICE CENTER
RALEIGH NC 27699-1631

QUESTIONS: Call (919) 733-6407

Entomological surveys for WNV surveillance in NC:

"Prevention and control of arboviral diseases is accomplished most effectively through a comprehensive, integrated mosquito management program" (CDC, 2001). In order to manage mosquito populations effectively, you must first locate them. Entomological surveillance, or targeting of mosquitoes for control, varies from locality to locality and is best done over a multi-year period. Cities, towns and counties with established mosquito management programs should have mapped the locations that generate the most complaints, require the most larviciding and adulticiding, have the most water-holding containers, have river and creek banks that flood and retain standing water, have animal waste lagoons, have lakes and ponds with emergent vegetation, have retention/detention ponds for flood water control, have water-holding street catch basins, and have known arboviral activity (e.g., EEE or LaCrosse). This information is important for the effective management of mosquitoes and the diseases they transmit, including WNV. Ideally, this information should be recorded and displayed on a geographic reference system so that inferences can be drawn from data patterns. Correlations between mosquito breeding locations and complaints or arbovirus occurrence should lead to control strategies specific to the problems in that area.

West Nile virus management also will depend on a thorough knowledge of mosquito breeding and activity patterns in a city, town or county. At a minimum, cities and towns should try to locate all their respective mosquito breeding sites and should have some knowledge of mosquito breeding sites in surrounding areas, from which mosquitoes may move into the municipality. A city or town program should detail the number and location of catch basins along city streets, and whether each one holds water for extended periods. This can be tedious, since a large city can have thousands of catch basins of varying designs and water-holding capacities. For example, the City of Charlotte has about 36,500 basins (information courtesy of Dennis Salmen). Since poorly maintained swimming pools can produce *Culex* spp. mosquitoes, survey the location and status of pools. Container-breeding mosquitoes may be important vectors of WNV in NC. In general, lower socioeconomic areas of a city or town will have more containers per yard or lot. A city or town should have information on the current numbers (or a suitable index) of containers within its boundaries for comparison after it has initiated a container clean-up campaign. Light traps should be used to determine the intensity of mosquito annoyance in areas throughout the municipality. Landing counts offer a less labor intensive but less useful measure of annoyance. Larval surveys should be done during breeding periods to determine species composition and extent of breeding.

County or district mosquito management programs in NC usually cover more land area than city or town programs and must include surveillance of fresh and saline water habitats. Breeding locations along river bottoms, lake margins, salt marshes, and in farmlands and logged areas should be located through larval surveys using standard dipping techniques. Aerial photography and USGS quad sheets can be helpful in locating breeding sites. Oviposition trapping also can be used to determine the species of mosquitoes in an area and to determine whether control techniques are working. Light trapping, especially with CO_2 supplementation, can be used to construct a list of species and their seasonality, which can then be used to target control efforts. Surveillance also should be used to prepare aerial spraying maps should it become necessary to implement large-scale control. The PHPM Section, NCDENR, has spray maps for most counties east of I-95 already prepared. These are available for review on our web site:
http://www.deh.enr.state.nc.us/phpm/Spray_Map/

Specific details on surveillance planning and interpretation are available from the Public Health Pest Management Section, NCDENR, at 919-733-6407, or from the Cooperative Extension Service. Unfortunately, neither of these resources can do the surveillance work for a city, town or county.

NHN
5 July 2001

Human Surveillance Component

Human Involvement with the West Nile virus (WNV) can take a variety of forms, ranging from completely asymptomatic infection at the submerged base of the pyramidal "iceberg" of manifest disease to overwhelming fatal meningoencephalitis at the tip. Obviously, the severe cases are most likely to be detected in surveillance for WNV infections, but even the most severe case may escape diagnosis and reporting if proper diagnostic tests are not performed.

A passive report card system for human cases of arboviral infection has been in place for a number of decades in North Carolina. This has become supplemented with laboratory-based reporting in recent years, and the increasing availability of more sensitive and specific virologic techniques for antigen and antibody detection has aided substantially in this area. Nonetheless, particularly with mild inflammatory disease of the central nervous system (CNS) – and all too often with even severe disease cases – appropriate virologic testing is not performed. With the advent of managed care, the mistaken view of specific testing for viral infections as costly, unnecessary, and unhelpful in clinical management has not improved.

Several approaches to improving the completeness of surveillance for human arboviral disease – including WNV disease – will be launched in 2001.

- *A flyer encouraging early reporting of suspect cases and briefly describing the clinical manifestations, epidemiology, and diagnostic tests available for arboviral CNS infections in the State Laboratory of Public Health (SLPH) will be distributed to primary care physicians through local health departments across the state.* [See attachment.] *At a minimum, this flyer should go to family practice physicians, general internists, geriatricians, pediatricians, and emergency room doctors in every community in NC.*
- *Periodic news releases describing the signs and symptoms of WNV disease, with special emphasis on the elderly, will be coordinated with the Division on Aging.*
- *The assistance of such groups as the NC Medical Society, the NC Chapter of the Association for Practitioners of Infection Control, and the NC Hospital Association will*

be requested in disseminating information about WNV infection, availability of diagnostic testing, and the importance of early reporting.

- *The State Laboratory of Public Health Virology/Serology Unit will work with commercial biomedical laboratories operating in NC to increase their awareness of WNV and secure their cooperation in sharing submitted specimens for follow-up testing in the SLPH.*

WEST NILE VIRUS ENCEPHALITIS

This flyer gives a brief overview of West Nile virus epidemiology and the clinical features of human infection. It concludes with information on submission of clinical specimens for diagnostic studies to the North Carolina State Laboratory of Public Health.

West Nile virus (WNV) was first isolated in the West Nile district of Uganda in 1937. It is now commonly found in humans, birds, and other vertebrates in Africa, Eastern Europe, West Asia and the Middle East, but — until 1999 — had not been documented in the Western Hemisphere. WNV epidemics among humans were reported in Israel in the 1950's, in France in 1962, in South Africa in 1974, in Romania in 1996 and in Russia in 1999.

In August and September 1999, two outbreaks occurred simultaneously in New York City and the surrounding areas. One was a zoonotic outbreak involving birds. Large numbers of dead crows in particular had been reported since the month of June and, in September, several exotic birds died at the Bronx Zoo. The other outbreak, among humans, was recognized after infectious disease physicians at a local hospital reported two cases of encephalitis with unusual presentation to the NYC Health Department. The cluster of human cases quickly grew, affecting mostly older adults, most of them also presenting with profound muscle weakness.

Meanwhile, after several dead exotic birds showed necropsy findings of encephalitis and myocarditis, specimens were sent for further testing. Tests for common avian pathogens and for arboviral encephalitis viruses were initially erroneously interpreted as positive for Saint Louis encephalitis virus infection, but eventually WNV was identified as responsible for both human and avian outbreaks.

In humans, the virus usually causes either asymptomatic infection or mild febrile disease. The clinical description of West Nile Fever classically includes fever, lymphadenopathy, headache, abdominal pain, vomiting, rash and conjunctivitis. The incubation period is usually five to 15 days. In a minority of cases the disease may be severe, with central nervous system involvement. Seven of the 62 documented cases in the NYC area in 1999 were fatal. Serologic studies suggest that about one in 150 human infections results in an illness severe enough to require hospitalization.

During the winter of 1999-2000, it was documented that the virus survived in mosquitoes that overwintered in the Northeast. Mosquito surveillance and control, bird and other animal surveillance for arboviral activity, and human disease surveillance were initiated in the eastern avian fly zone and, by the end of the 2000 transmission season, WNV activity had been identified in a 12-state area from New Hampshire and Vermont to North Carolina. Last year there were 21 human cases and two deaths documented in the entire United States; these all occurred in northeastern states (CT, NJ, and NY).

All forms of arboviral encephalitis — not just WNV disease — are reportable in North Carolina, and the NC Division of Public Health is urging the medical community to promptly report suspected cases of encephalitis to local health departments.

Laboratory testing for WNV and other arboviral infections (eastern encephalitis, western encephalitis, Saint Louis encephalitis, and La Crosse virus encephalitis) is available at the State Laboratory of Public Health. Testing of acute and convalescent sera for antibody levels is available for these viruses, including the ability to detect IgM antibodies. An acute serum specimen should be submitted when drawn rather than being held for submission pending collection of a convalescent serum two-three weeks after illness onset. CSF specimens can be submitted for both virus detection and antibody level determination. CNS tissue specimens (cerebral cortex, medulla, cerebellum, and hippocampus) for virus isolation should be shipped refrigerated but not frozen.

Since WNV infection can be manifest as aseptic meningitis as well as encephalitis, all clinical specimens (csf, paired sera) sent to the SLPH for any suspected viral CNS infection will be tested for the panel of arboviral agents listed above.

West Nile Virus (WNV) SURVEILLANCE TESTING in NORTH CAROLINA

The North Carolina State Laboratory of Public Health (NCSLPH) provides certain medical and environmental laboratory services (testing, consultation and training) to public and private health provider organizations responsible for the promotion, protection and assurance of the health of North Carolina citizens. The Animal Disease Diagnostic Laboratory System, Veterinary Division of the NC Department of Agriculture and Consumer Services, provides animal disease testing to identify animal diseases and ensure general animal health. Any animal tissue suspected of WNV infection will be referred to the NCSLPH or other reference laboratory for analysis. The laboratories at both these state agencies are actively involved in the identification of WNV from human, non-human animal, avian, and mosquito samples. Collection and submission of these samples is controlled through specific surveillance protocols. The purpose of this fact sheet is to summarize the general laboratory procedures used to determine WNV activity.

I Human Enhanced Passive Surveillance:

A) Isolation Specimens: All viral isolation specimens submitted to the SLPH on patients with CNS disease will be tested in Vero cell culture for arboviruses. They will be identified via IFA and confirmed via nucleic acid amplified technology (NAAT) specifically for the presence of WNV or EEE.

B) Serologic Specimens: All serological specimens submitted to the SLPH on patients with CNS disease will be tested via commercial IgG indirect-fluorescent antibody (IFA) tests with:

- St. Louis Encephalitis Virus (serves as surrogate marker for WNV);
- Eastern Equine Encephalitis Virus;
- Western Equine Encephalitis Virus (surrogate marker for Highlands-J);
- LaCrosse Encephalitis Virus;
- West Nile Virus.

[Sera reactive in the above IFA test for SLE and/or WNV will be subsequently tested via HAI and the plaque reduction serum neutralization (PRNT) assay at the SLPH BSL-3 facility.]

II Veterinary Enhanced Passive Surveillance:

The Animal Disease Diagnostic Laboratory System, Veterinary Division, NC Department of Agriculture and Consumer Services, will refer samples to the appropriate laboratory for WNV testing from all suspect case submissions. Samples from equine cases with central nervous system signs will be submitted to the NC State Laboratory of Public Health (SLPH) for rabies and arboviral testing. Samples may also be submitted to the National Veterinary Services Laboratory for arboviral testing. Samples from suspected avian cases will be submitted to the USGS National Wildlife Health Center.

All equines submitted to the SLPH for routine rabies testing, and that are rabies test negative, will be further tested via viral isolation in Vero cell culture for arboviruses. They will also be tested via NAAT specifically for the presence of WNV or EEE. Limited testing of other mammals submitted with suspect WNV infection may be available and will be judged on a case-by-case basis.

III Mosquito Active Surveillance:

Mosquito pools will be homogenized in the laboratory and viral isolation in Vero cell culture will be attempted. Mosquito viral isolates will be identified by IFA testing and confirmed with NAAT. Selected "culture negative" pools of mosquitoes will also be tested directly via NAAT.

IV Sentinel Chicken Active Surveillance:

Chicken sera will be forwarded to the SLPH for serological testing using a commercial IgG indirect-fluorescent antibody (IFA) test with:

- St. Louis Encephalitis Virus (serves as surrogate marker for WNV);
- Eastern Equine Encephalitis Virus;
- Western Equine Encephalitis Virus (surrogate marker for Highlands-J);
- LaCrosse Encephalitis Virus.

[Sera reactive in the above IFA test for SLE will be retested using IFA reagents specific for WNV. Repeat reactives will be subsequently tested via HAI and plaque reduction serum neutralization (PRNT) assay at the SLPH BSL-3 facility.]

Insect Repellents At-A-Glance

Mark S. Fradin, M.D.

DEET

- Man-made chemical, used by millions since 1957
- Broadest-spectrum repellent
- Works on: mosquitoes, ticks, flies, chiggers, etc.
- Longest-lasting repellent, proven up to 12 hours
- Best-studied, most scrutinized repellent on market
- Available in 5-100% concentrations
- Safe, but apply with common sense

IR3535 (Skin-So-Soft Bug Guard Plus IR3535)

- Man-made analog of alanine
- Labeled for use against mosquitoes, ticks, flies
- Used in Europe ~ 20 years & in US since July '99
- Variable efficacy reported
- Less effective than DEET against mosquitoes
- More effective than DEET against some flies
- Available only from Avon Corp. in US

Skin-So-Soft Bath Oil

- Rumored to reduce insect bites
- Proven to have little repellent effect
- Half-life of effectiveness ~ 30 minutes
- 10X *less* effective than 12.5% DEET
- Distributed in US by Avon Corp.
- Effect from fragrance or other chemicals in Oil

Citronella

- Plant-derived oil, from 2 cultivated grasses
- Most common ingredient in "natural" repellents
- Often mixed with other botanical oils
- Used in US since 1948
- Studies show very variable, limited efficacy
- Reported repellent effect: minutes to 2 hours
- For maximum effectiveness, reapply hourly

Blocker™

- Active ingredient: soybean oil
- Also contains: coconut and geranium oil
- Available in US since 1997
- Labeled for use against mosquitoes and flies
- Variable efficacy reported
- Not for use as a tick repellent
- Probably most effective of the botanical repellents

PMD (p-menthane-3,8-diol)

- Derived from lemon eucalyptus plant
- Used in China for 30 years ("quwenling")
- Available in Europe as Mosiguard™
- Works against mosquitoes, flies, ticks
- Effectiveness comparable to 30%-50% DEET
- Should be available in US, Summer 2001

Permethrin

- Man-made contact insecticide
- Originally derived from *Chrysanthemum* daisy
- Causes incapacitation or death of insects
- Kills mosquitoes, ticks, flies, chiggers, fleas, lice
- Spray on fabric, not skin
- Very long-lasting effect, ~ 2 weeks after 1 spray
- Best choice for a tick repellent

For Maximum Protection

- Wear protective clothing/hat
- Apply insect repellent to exposed skin
- Spray permethrin on clothes

Won't Work!

- Outdoor UV/electrocuting-type bug zappers
- Personal mosquito repellers
- Citronella plants or citronella candles
- Ingested garlic, brewer's yeast, thiamine
- Bat houses or bird houses

Relief From Insect Bites

- Cool compress
- Topical steroids
- Oral antihistamines can be taken prophylactically
- AfterBite™ (ammonium solution)
- Avoid topical anesthetics and diphenhydramine

United States Prevention, Pesticides May 2000
Environmental and Toxic substances 735-F-00-001 **Adapted from the EPA document:**
Protection Agency (7506C)

FOR YOUR INFORMATION
Malathion for Mosquito Control

The Environmental Protection Agency (EPA) evaluates and registers (licenses) pesticides to ensure they can be used safely. These pesticides include products used in the mosquito control programs which states and communities have established. To evaluate any pesticide, EPA assesses a wide variety of tests to determine whether a pesticide has the potential to cause adverse effects on humans, wildlife, fish and plants, including endangered species and non-target organisms.

Officials responsible for mosquito control programs make decisions to use pesticides based on an evaluation of the risks to the general public from diseases transmitted by mosquitoes or on an evaluation of the nuisance level that communities can tolerate from a mosquito infestation. Based on surveillance and monitoring, mosquito control officials select specific pesticides and other control measures that best suit local conditions in order to achieve effective control of mosquitoes with the least impact on human health and the environment. It is especially important to conduct effective mosquito prevention programs by eliminating breeding habitats or applying pesticides to control the early life stages of the mosquito. Prevention programs, such as elimination of any standing water that could serve as a breeding site, help reduce the adult mosquito population and the need to apply other pesticides for adult mosquito control. Since no pesticide can be considered 100% safe, pesticide applicators and the general public should always exercise care and follow specified safety precautions during use to reduce risks. This fact sheet provides basic information on malathion, an insecticide used in mosquito control programs.

What is Malathion?
Malathion is an organophosphate (OP) insecticide that has been registered for use in the United States since 1956. It is used in agriculture, residential gardens, public recreation areas, and in public health pest control programs. When applied in accordance with the rate of application and safety precautions specified on the label, malathion can be used to kill mosquitoes without posing unreasonable risks to human health or the environment.

How is Malathion Used in Mosquito Control?
The mosquito goes through four distinct stages during its life cycle: egg, larva, pupa, and adult. Malathion is an *adulticid*e, used to kill adult mosquitoes. In mosquito control programs conducted by state or local authorities, malathion is applied by truck-mounted or aircraft-mounted sprayers. Malathion is applied as an ultra-low volume (ULV) spray. ULV sprayers dispense very fine aerosol droplets that stay aloft and kill mosquitoes on contact. ULV applications involve small quantities of pesticide active ingredient in relation to the size of the area treated. For mosquito control, malathion is applied at a maximum rate of 0.23 pounds (or about two and one-half fluid ounces) of active ingredient per acre, which minimizes exposure and risks to people and the environment.

Does Malathion Pose Risks to Human Health?
Malathion can be used for public health mosquito control programs without posing unreasonable risks to the general population when applied according to the label. EPA has estimated the exposure and risks to both adults and children posed by ULV aerial and ground applications of malathion. Because of the very small amount of active ingredient released per acre of ground, the estimates found that for all scenarios considered, exposures were hundreds or even thousands of times below an amount that might pose a health concern. These estimates assumed several spraying events over a period of weeks, and also assumed that a toddler would ingest some soil and grass in addition to skin and inhalation exposure.

However, at high doses, malathion like other organophosphates, can overstimulate the nervous system causing nausea, dizziness, or confusion. Severe high-dose poisoning with any organophosphate can cause convulsions, respiratory paralysis and death.

Does Malathion Pose Risks to Wildlife or the Environment?
Malathion used in mosquito control programs does not pose unreasonable risks to wildlife or the environment. Malathion degrades rapidly in the environment, especially in moist soil, and it displays low toxicity to birds and mammals. Malathion is highly toxic to insects, including beneficial insects such as honeybees. For that reason, EPA has established specific precautions on the label to reduce such risks.

What is the Current Regulatory Status of Malathion?
As part of its responsibility to reassess all older pesticides registered before 1984, EPA is currently reviewing malathion as part of its reregistration process. The review of malathion is scheduled for completion this calendar year. A preliminary risk assessment covering all uses of malathion is currently available to the public for review. Visit the EPA web site (see address below) for the most current information on malathion assessment.

For more information on pesticides and mosquito control, visit the EPA web site and review this document:
http://www.epa.gov/pesticides/op/malathion/qs%26as-2000v8.pdf

DHHS Notification Protocol for West Nile Virus

*(Note: Because the state is constantly monitoring for the presence of West Nile virus North Carolina is considered to be operating under a **Public Health Watch**. The subsequent levels of response as indicated below will be invoked when WNV is actually confirmed in animals or humans.)*

When the Public Health Pest Management Section in the Department of Environment & Natural Resources advises DHHS that there has been one or more laboratory-confirmed positive results (animal or mosquito pool testing) for the West Nile Virus the following notification policy will be followed.

- The State Health Director will issue a **Public Health Warning** due to West Nile Virus.
- County Officials will be notified by telephone before the release is issued.
- The DHHS Public Affairs Office and the Division of Environmental Health PIO will notify the public/media via a news release that details the area of concern and the standard precautions that citizens should take.

When the State Laboratory of Public Health confirms that there has been one or more positive results, especially in humans, for the West Nile Virus the following notification policy will be followed.

- The State Health Director will issue a **Public Health Alert** due to West Nile Virus.
- County Officials will be notified by telephone before the release is issued.
- The DHHS Public Affairs Office and the Division of Environmental Health PIO will notify the public/media via a news release that details the area of concern and the standard precautions that citizens should take.

The DHHS Office of Public Information and the appropriate DENR public information officer will work together on notifications and will split up responsibilities. (*Note:* DENR maintains an additional notification list.)

WEST NILE **NOTIFICATION**

The *DHHS West Nile Virus Contact Information Guide* has been produced to make certain that appropriate county contacts receive correct information. The DENR Public Affairs Office will notify all appropriate DENR contact persons.

Prior to distributing the news release, the following **must** be notified:
Local Health Department
Governor's Office - Phone 733-5612; fax 733-5166
Agriculture – Phone 733-4216
Travel and Tourism - fax 733-8582

DHHS will make every attempt possible to notify the following prior to release:
Any legislator who represents the district where the Warning/Alert is issued.
County manager or commission chairman of county(ies) affected.
Travel and Tourism Regional Office:

Chris Mackey - fax (919) 733-8582
Carol Lohr (regional) - fax (252) 726-0990
Sandy Richardson (regional) - fax (252) 637-1919
Janice Roamer (regional) - fax (910) 455 8014
Judith Grizzel (regional) - fax (910) 341-4029
Nancy Nichols (regional) - fax (252) 482-7093

The news release will be distributed in the following fashion and in the following order:
Media in home county of affected area
AP
News and Observer
Statewide media

Follow-up calls will be made to AP, media in affected county, TV stations in coverage area and major paper of record to make certain that the news release has been received.

DHHS/DENR West Nile Public Information Plan 2001

March 14, 2001

GOALS:

1. Highlight public health efforts in regard to West Nile and its prevention
2. Raise public awareness of the need to report dead birds and the toll-free line and local contact point for reporting
3. Inform public about health implications associated with West Nile

TOOLS:

- **"Free" media** (generated through news releases, PSAs, media events)
- **Toll-free hotline**
- **Flyers and brochures for general public**, aimed at explaining prevention (Tip-n-Toss), potential health problem and urging people to call the toll-free line.
- **Information for medical & environmental professionals**
- **Web site addresses**
- **Speaker's bureau**, which involves getting local environmental health/health speakers on civic groups' meeting agendas and notifying the local media to make sure that they know about the event
- **Partnering with environmental groups** to get the message out through joint programs, educational efforts, etc.

PLAN

With limited resources, DHHS will focus on broad-based, statewide awareness pieces and supporting more targeted, local efforts. Local health personnel will receive prior notice of news releases as required by our notification procedure and will be invited to participate in media events.

MARCH

- Create campaign logo for material and promotional continuity
- Review and revise West Nile/Mosquito Control Facts booklets
- Create and revise notification procedure; establish notification lists
- Review hotline protocols and information resources

APRIL

- Kick off awareness effort with general warning from the state health director
- Seek to have state experts invited to major TV/Radio talk shows.
- Provide news release templates, protocols, and updated materials to locals
- Develop West Nile presentation
- Review and update websites
- Initiate coordination of educational information with DPI

MAY
- Continue seeking major media ops.
- Work on partnering with environmental groups
- Continue website updates/revisions
- Remind health departments and others about seeking speaker's bureau
- Provide West Nile information for state public health association meetings

JUNE
- Continue major media ops, speaker's bureau, information distribution, partnering with environmental groups
- Participate in Internet chat room discussion of human health effects of West Nile

JULY
- Send out release to local reporters, stressing importance of toll-free reporting of dead crows listing standard protocol
- Continue speaker's bureau, information distribution, partnering with environmental groups

AUGUST
- Continue speaker's bureau, information distribution, partnering with environmental groups

Release: Immediate

Contact: Kimberly Hattaway 919-715-3204,

Date: May 2, 2001

Distribution: AP

State Health Officials Call for "Skeeter Defeaters" to Curtail Mosquito-Borne Diseases

RALEIGH – Paying heed to last year's late season arrival of West Nile virus, state public health officials are urging all state residents to become "Skeeter Defeaters" by taking steps to eliminate mosquito breeding grounds, reduce unnecessary exposure to mosquito bites, and report dead or dying birds.

"We have adopted the term 'Skeeter Defeater' as a way to help raise public awareness," Nolan Newton, NC Public Health Pest Management Section Chief said. "We want people to know that, by taking specific precautions, they can help protect themselves from our state's more traditional mosquito-borne viruses as well as West Nile virus, which was found last year in a Chatham County crow. Working together, we can reduce exposures and fully enjoy our traditional outdoor activities."

While Eastern Equine Encephalitis (EEE) and LaCrosse Encephalitis are well established in North Carolina, West Nile virus is new to the state. In preparing for West Nile virus, state health officials have increased surveillance efforts for mosquito-borne disease. Like EEE, West Nile virus is transmitted to humans when a mosquito that has bitten an infected wild bird then bites a person.

Key to state and local efforts to monitor for the disease and to reduce mosquito populations is citizen participation, Dr. Newton said. Tar Heel residents can help monitor for West Nile virus by reporting dead birds – especially crows, blue jays and hawks – to their local health departments or the Public Health Pest Management Section at 1-877-790-1747 or via e-mail at NCWNV@NCmail.net. An online form for reporting dead birds is also available at www.deh.enr.state.nc.us/phpm/deadbirdform/index.html.

Only bird carcasses that are whole, appear to be less than 36 hours old, do not have an odor, and do not have maggots inside or outside of the bird should be reported. Collection of bird carcasses for testing may cease once the virus has been detected in a specific area.

Residents can also help eliminate potential mosquito breeding grounds. Given the warming weather and recent rainfall, it is likely that conditions will soon favor mosquito hatchings. By throwing away or emptying anything that can hold water, such as tires, flower pots, and bottles, residents can reduce mosquito populations around their homes and work places. Gutters should be kept clean and in good repair. Leaky outdoor faucets should be repaired and the water in bird baths and pet bowls should be emptied at least twice a week.

Once mosquitoes arrive, bites can be prevented by wearing long sleeves and pants with the legs tucked into socks. Use a repellent containing low concentrations of DEET (10 percent or less for children; 30 percent or less for adults), following the manufacturer's instructions. Avoid outdoor activities in the evening, when mosquitoes are most active. Use screened windows and doors and make sure screens fit tightly and are not torn.

For more information about mosquitoes and mosquito-borne disease, see the Public Health Pest Management section's Web site at www.deh.enr.state.nc.us/phpm/pages/index.htm.

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Insertion of brochures and flyers (PDF files)

WNV and Related Web Sites

www.cdc.gov/ncidod/dvbid/westnile/q&a.htm - CDC's West Nile virus Questions and Answers

www.cdc.gov/ncidod/dvbid/westnile/ - CDC's West Nile virus background information

www.aphis.usda.gov/oa/wnv/index.html – USDA, Animal and Plant Health Inspection Service's Update on Current Status of West Nile virus cases

www.deh.enr.state.nc.us/phpm/pages/index.html - NC Division of Environmental Health, Public Health Pest Management Section's information on West Nile virus

http://www.deh.enr.state.nc.us/phpm/pages/Health_Issues/Sentinel_Flock_Program/sentinel_flock_program.html – Public Health Pest Management Section's information on sentinel flocks

http://ipmwww.ncsu.edu:8150/NCMVCA/county%20programs/counties.htm for local mosquito control programs in North Carolina

www.health.state.ny.us/nysdoh/westnile/index.htm - New York State Department of Health's West Nile virus Consumer Information home page. This site includes links to information for healthcare providers, information about pesticides, and educational materials.

http://www.nbii.gov/issues/invasive/wnv/index.html - U.S. Geological Survey, National Biological Information Infrastructure's information on West Nile virus. This site includes latest news about WNV, information about human health effects associated with WNV, and state and regional information.

http://www.epa.gov/pesticides/factsheets/skeeters.htm – EPA, Office of Pesticide Programs information on Pesticides and Mosquito Control. This site includes fact sheets that can be downloaded.

http://www.epa.gov/pesticides/citizens/insectrp.htm - EPA Office of Pesticide Programs information on Using Insect Repellents Safely

http://www.cfe.cornell.edu/risk/WNV/ - Cornell University's information on West Nile virus

http://www.ci.nyc.ny.us/html/doh/html/wnv/wnvhome.html - New York City Department of Health's information on West Nile virus

http://www.ces.ncsu.edu/depts/ent/notes/Urban/wnv-lagoon.htm - NC State University, Department of Entomology's information on West Nile virus